REMARKS

Reconsideration and allowance for the above-identified application are respectfully requested. Claims 1-15 are pending, wherein claims 1 and 8 have been amended and claims 14 and 15 have been added.

Initially, Applicants note with appreciate the Examiner's consideration of the documents submitted with the Information Disclosure Statement (IDS) filed on August 21, 2002. Applicants also note with appreciation the Examiner's acknowledgement of Applicants' claim for domestic priority under 35 U.S.C. § 119(e), and the Examiner's approval of the drawings filed on January 9, 2002.

In the fourth paragraph of the Office Action, claims 1, 3, 4, 8, 10 and 11 are rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Kuniharu Kato et al., *Optical Coupling Characteristics of Laser Diodes to Thermally Diffused Expanded Core Fiber Coupling Using an Aspheric Lens*, IEEE Photonics Technology Letters, vol. 3, no. 5, May 1991, at 469-470 (hereinafter, "Kato"). This ground of rejection is respectfully traversed.

As is well-known, optical fibers are used to transmit light in an optical system. Light entering or leaving at a termination end of an optical fiber is focused into the core. Accordingly, at the point where light enters or leaves the termination end of the fiber, the intensity of the light is related to the diameter of the core. The smaller the core diameter, the smaller the diameter of the light spot formed on the end of the fiber and the greater the intensity of light entering or leaving the termination end of the optic fiber. Because of the high power associated with this intensity, if any contaminants or irregularities are present at the termination end of the fiber, they may act as focusing lens, creating localized spots for even higher intensities on the fiber end. At these high intensities, light may burn the termination end of the fiber, damaging the dielectric coating that decreases insertion loss due to reflection, or may also burn the optical fiber itself. In such situations, the damage may increase the insertion loss and reflection of the fiber end. Additionally, the burning may damage the fiber so much that it is unable to operate properly and cause system disruption.

According to exemplary embodiments of the present invention, the above-identified deficiencies found in conventional fiber optic systems are overcome. For example, the present

invention provides for a thermal-diffusion expanded core (TEC) optical fiber that has a core diameter at an end of the optical fiber that is larger than the core diameter towards the other portions. Further, embodiments provide for a light spot diameter that is larger than the diameter of the unexpanded portion of the core. Because the light spot is larger than it would be if the end of the fiber had not been thermally expanded the intensity of the light is less than it would be if the light had been focused to have a smaller light-spot diameter at the fiber end. In addition, because the focusing area at the termination end is larger than the core diameter in the non-expanded portion of the fiber, the power can be greatly increased, yet reduce the possibility that the high intensity will damage the termination end of an optical fiber.

Claim 1 is directed toward the aforementioned embodiment, and recites an optical device comprising a TEC optical fiber including a first core, wherein a diameter of the first core at a first end of the TEC optical fiber is larger than a diameter of the first core in an unexpanded portion of the TEC optical fiber. Further, claim 1 recites that a focusing lens is configured to focus light into the first end of the TEC optical fiber such that the light spot created by the focused light on a surface of the first end of the TEC optical fiber has a light spot diameter that is larger than the diameter of the first core in the unexpanded portion of the TEC optical fiber.

Applicants respectfully submit that claim 1 is not anticipated by Kato for at least the reason that Kato does not disclose each and every element of claim 1. For example, Kato does not disclose a TEC optical fiber as in claim 1 with a focusing lens configured to focus light into the first end of the TEC optical fiber such that a light spot created by the focus light on a surface of the first end of the TEC optical fiber has a light spot diameter that is larger than the diameter of the first core in the unexpanded portion of the TEC optical fiber.

Kato discloses optical coupling characteristics of laser diodes to thermally diffused expanded core fiber coupling using an aspheric lens. The Office Action alleges that Figure 1 of Kato discloses a focusing lens configured to focus light into the first end of the TEC optical fiber such that a light spot created by the focused light on a surface of the first end of the TEC optical fiber has a light spot diameter that is larger than the diameter of the first core in the unexpanded portion of the TEC optical fiber. Although Figure 1 discloses a TEC fiber and an aspheric lens for coupling light from a laser diode to the TEC fiber, Figure 1 and the description associated therewith give no reference to a spot size. Rather, Figure 1 shows an illustration of coupling loss evaluated by the ratio of the TEC fiber output power over the laser diode output power as a

function of the lateral offset parallel to the laser diode p-n junction. Kato, however, is not concerned with the damage caused by the intensity of a focused laser beam on the end of an optical fiber, and in fact, Kato is silent with regards to a light spot diameter. Accordingly, because Kato is silent with regards to spot size, Kato cannot disclose an optical device that has a focusing lens configured to focus light into the first end of the TEC optical fiber such that a light spot created by the focus light on a surface of the first end of the TEC optical fiber has a light spot diameter that is larger than the diameter of the first core in the unexpanded portion of the TEC optical fiber, as recited, *inter alia*, in claim 1. As such, Applicants respectfully submit that Kato does not anticipate claim 1.

Claim 8 discloses a method of operating an optical device with similar elements as those discussed above with regards to claim 1. Accordingly, Applicants respectfully submit Kato does not anticipate claim 8 for at least those reasons stated above with regard to claim 1.

Claims 3, 4, 10 and 11 variously depend from claims 1 and 8; and are therefore, not anticipated by Kato for at least those reasons stated above with regard to claims 1 and 8.

For at least those reasons stated above, Applicants respectfully request that the rejection of claims 1 3, 4, 8, 10 and 11 as allegedly being anticipated by Kato be withdrawn.

In the sixth paragraph of the Office Action, claims 2 and 9 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Kato. This ground of rejection is respectfully traversed.

As discussed above with regard to claims 1 and 8, Kato does not disclose an optical device, or method of operating an optical device, with a TEC optical fiber and a focusing lens configured to focus light into the first end of the TEC optical fiber such that the light spot created by the focused light on a surface of the first end of the TEC optical fiber has a light spot diameter that is larger than the diameter of the first core in the unexpanded portion of the TEC optical fiber. Further, it is respectfully submitted that Kato does not suggest an optical device, or method of operating such an optical device, that has a TEC optical fiber and a focusing lens configured to focus light into the first end of the TEC optical fiber such that the light spot created by the focused light on a surface of the first end of the TEC optical fiber has a light spot diameter that is larger than the diameter of the first core in the unexpanded portion of the TEC optical fiber as recited in claims 1 and 8. Accordingly, Kato does not render claims 1 and 8 unpatentable.

Because claims 2 and 9 depend from claims 1 and 8, respectively, claims 2 and 9 are patentably distinguishable over Kato for at least those reasons stated above with regard to claims 1 and 8.

For at least those reasons stated above, Applicants respectfully request that the rejection of claims 2 and 9 as allegedly being unpatentable in view of Kato be withdrawn.

In the seventh paragraph of the Office Action, claims 1, 5-7, 8 and 12-13 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 5,825,950 to Cheng (hereinafter, "Cheng"). This ground of rejection is respectfully traversed.

Applicants respectfully submit that Cheng does not render claim 1 unpatentable, for at least the reason that Cheng does not disclose or suggest all of the elements of claim 1. For example, Cheng does not disclose or suggest an optical device with a TEC optical fiber and a focusing lens configured to focus light into the first end of the TEC optical fiber such that a light spot created by focused light on the surface of the first end of the TEC optical fiber has a light spot diameter that is larger than the diameter of the first core in the unexpanded portion of the TEC optical fiber, as recited, *inter alia*, in claim 1.

Cheng discloses polarization independent optical isolating element that is coupled to a TEC optical fiber. Cheng, however, does not disclose or suggest an optical device with a focusing lens configured to focus light into the first end of the TEC optical fiber such that the light spot created by the focus light on a surface of the first end of the TEC optical fiber has a light spot diameter that is larger than the diameter of the first core in the unexpanded portion of the TEC optical fiber.

Recognizing the deficiencies of Cheng, the Office Action acknowledges that "Cheng does not specifically disclose that the light spot created by the focus light on a surface of the first end of the TEC optical fiber has a light spot diameter that is larger than the diameter of the first core in the unexpanded portion of the TEC optical fiber." The Office Action, however, has not provided a prior art reference that discloses or suggests the acknowledged deficiencies of Cheng. Accordingly, because the Office Action acknowledges that Cheng does not disclose or suggest all of the elements of claim 1, and because the Office Action has not provided a prior art reference which remedies the admitted deficiencies of Cheng, Cheng does not render claim 1 unpatentable.

As mentioned above, claim 8 recites a method of operating an optical device with similar elements of those described above with regard to claim 1. Accordingly, claim 8 is not unpatentable over Cheng for at least those reasons stated above with regard to claim 1.

Claims 5-7 and 12-13 variously depend from claims 1 and 8, respectively. Accordingly, claims 5-7 and 12-13 are patentably distinguishable over Cheng for at least those reasons stated above with regard to claims 1 and 8.

In view of the above, Applicants respectfully request that the rejection of claims 1, 5-7, 8 and 12-13 as allegedly being unpatentable over Cheng be withdrawn.

All objections and rejections having been addressed, Applicants respectfully submit that the present application in condition for allowance and a notice to this effect is earnestly solicited. Should any questions arise in connection with this application, or should the Examiner believe that a telephone conference with the undersigned would be helpful in resolving any remaining issues pertaining to this application, the undersigned respectfully requests that he be contacted at (801) 533-9800.

Dated this 9th day of February, 2004.

Respectfully submitted,

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